The MAC Flyer

SEPTEMBER 1981

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The MAC Flyer

MILITARY AIRLIFT COMMAND

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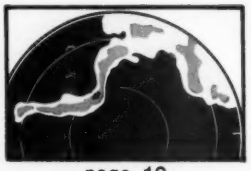

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Chief of Staff Individual Safety Award

Lieutenant Colonel Dwight A. Sweet.

CITATION

TO ACCOMPANY THE AWARD OF THE

CHIEF OF STAFF INDIVIDUAL SAFETY AWARD

The Chief of Staff Individual Safety Award for 1980 is presented to Lieutenant Colonel Dwight A. Sweet in recognition of his outstanding contribution to the accident prevention programs of the Military Airlift Command and the United States Air Force.

Colonel Sweet served as Chief of Safety for the 314th Tactical Airlift Wing, largest tactical airlift wing in the United States Air Force. Despite the diverse, complex, and worldwide mission of the wing, he implemented a highly effective safety program that involved all commanders, supervisors, and assigned personnel in before-the-fact accident prevention. Through his outstanding professional skills, safety leadership, and dedication, the wing flew 80,000 accident-free hours, significantly reduced military and civilian disabling injury rates and Air Force motor vehicle mishaps, and greatly enhanced the operational effectiveness of the wing.

The singularly distinctive accomplishments of Colonel Sweet perpetuate the high standards established for the Chief of Staff Individual Safety Award and reflect great credit upon himself and the United States Air Force.

LEW ALLEN, JR., General, USAF
Chief of Staff

Resource Management on the Flight Deck

A simulator scenario helps aircrews improve their learning curve.

In an effort to learn more about how crew-member performance might be downgraded during high workload situations, NASA's Ames Research Center conducted an experiment in 1976 designed specifically to study air carrier crews performance and error rates under pressure. To achieve the objectives of the study, the flight crews were asked to "fly" a full-mission simulator. The "scenario" put them through a variety of workload situations and data was collected in five categories.

- Observers Comments: Two observers, stationed in the simulator cab, continuously noted relevant information, including time-since-takeoff, significant actions, the pilot in control, automatic control modes used, tracks, heading, radio frequencies, etc. They provided a complete descriptive commentary on a continuously running seven-track tape.
- Crew Paperwork: All paperwork relative to each run was collected and reviewed for accuracy.
- Electrocardiograms (EKG): On the assumption that "arousal" could be correlated with certain aspects of individual performance, each of the crew participants was wired with single-lead EKG electrodes and the heart rates were recorded on the continuously running tape.
- Flight Deck Communication: Flight deck communication was picked up via an overhead mike and also fed onto the seven-track tape, as were both sides of all crew communications with "ground facilities."
- Aircraft Parameters: All relevant aircraft performance information was obtained from the simulator's digital computer.

Full Mission Scenario

The aircraft type simulated was a "contemporary wide-body" in service with the airlines and likely to be one of the mainstays of civil aviation for many years to come. Since time on this particular simulator was available only in blocks of 4.5 hours, the flight was tailored to fit this limitation. The scenario was constructed to cover a routing unfamiliar to the participating crews, but still realistically permit a comparison of performance during both high and low workload periods. The experimenters decided on a charter trip from Dulles to Heathrow (London), with a stop at Kennedy for fuel and cargo.

The first leg lasted about 45 minutes and was designed to use standard operating, air traffic and navigation procedures. During this sortie neither weather nor runway conditions for takeoff or landing would provide any difficulty for a regular airline crew. Although one of the two autopilots was unserviceable, no further mechanical failures occurred. During the cruise phase of this first leg, ATC warned the crew about thunderstorm activity and they were subsequently diverted around this by radar vectors. The crews were only required to turn on engine ice protection and to warn the passengers to fasten their seat belts. This initial sortie was designed to provide a comparatively low workload situation, allow crews to become familiar with each other, and to get accustomed to the EKG electrodes and simulator environment. At the end of the first flight a 30-minute turn-around at Kennedy for fuel and cargo onload was simulated.

The second leg was planned to produce a high workload situation requiring decision-making in stressful situations. The aircraft was almost at maximum gross weight for takeoff, the runway conditions and winds were marginal for this weight, the standard instrument departure from New York was complex, and the published instructions were unclear. There was also a last minute change in the clearance that modified the SID. This busy departure was followed by an uneventful climb for about 30 minutes to FL 310. At the top of the climb, after cruise speed had been attained and the appropriate power selected, slow clogging of number two engine oil filter was started. This affected the differential pressure across the filter and was shown on a combined oil

pressure gauge on the engineer's systems panel. A warning light on the central warning panel, located to the right of the captain's flight instruments, was later illuminated. The allowable pressure differential was exceeded and the engine had to be shut down; thus an opportunity was provided for assessing vigilance and timeliness of decisions.

The clogged oil filter presented the crew with several problems that required information retrieval and decisions. At this time it was immediately obvious to the crews that FL 310 could not be maintained on the remaining engines without overboosting them and the flight to London would have to be abandoned. These factors created an immediate need to coordinate diversion routing with ATC to the nearest airport with suitable weather and runway conditions and to determine how navigation to this destination was to be achieved. With the heavy fuel load, the aircraft was overweight for a landing at any nearby airport in the Northeastern United States. There was a right time and place to dump fuel to allow for a safe landing at the chosen alternate airfield, while retaining enough as a reserve for a further diversion should the runway be unavailable.

By manipulating the weather and runway conditions, the scenario forced the decision to return to a particular runway at Kennedy, all others being precluded either by high crosswinds or by a combination of repair work in progress or damaged aircraft on the runway. During this return, while the flight engineer (FE) was engaged in dumping fuel, the number three hydraulic system was slowly depleted to zero. This additional failure provided an opportunity for measuring the vigilance of a busy engineer and further affected the operation of the aircraft. Subsequent to the hydraulic failure, the only remaining autopilot failed, thus necessitating hand flying the aircraft which, in turn, further increased the workload.

Nearing New York, air traffic control required the crew to fly a specific holding pattern at a time when they were concerned with the marginal weather at New York and the short length of the runway in use. Finally, a hand-flown ILS approach had to be accomplished with asymmetric power to a wet runway in a strong crosswind, followed by a landing that was safe only with the correct amount of automatic braking and immediate application of symmetrical reverse thrust.

Analysis

The second sortie started with a high workload that was followed by a period of low workload that tended to lull the crew into complacency. Then there was a sudden onset of circumstances requiring ever-increasing information retrieval, decision-making and skill. At the same time, simulation of a cabin crewmember relaying complaints and requests from upset and anxious passengers provided extra harrassment. The whole scenario was based on situations that had happened in real life, and none of the participating crewmembers considered it in any way unrealistic.

Crewmembers volunteering to participate were all from the same carrier and were selected on the basis of their availability coinciding with the simulator's availability. Twenty complete crews participated. Flying experience ranged from 33 to 41 years for captains, 16 to 32 years for first officers (FOs) and 20 to 37 years for FEs. The first two complete crews were used to evaluate recording methods and to practice standardizing the various phases of the scenario. Thus 18 crews were actually used to collect data.

Participants were, of course, fully briefed on the purpose of the study and agreed to all conditions. The project coordinator briefed the basic flight, but didn't disclose the full scenario. Crews were also given all the standard departure paperwork, weather information, weight-and-balance data, runway availability, etc.

Crewmembers went through their usual discussion of operational plans, then the FE entered the simulator to do the preflight while the captain and first officer went over things like gross takeoff weight, power settings, runway conditions and navigation. All were aboard, with EKG leads hooked up, 20 minutes prior to scheduled departure. Preflight actions and the simulator flights themselves were conducted as authentically as possible. In addition to the highly sophisticated simulator capabilities—six axes of motion, complete visual system, etc.—further realism was added by including pertinent air traffic control communications plus a background of audible radio contacts with other aircraft. As previously noted, a requirement to deal with certain passenger matters from the cabin was also included.

Post-flight actions included a very thorough debrief, but carefully avoided discussions regarding faults in flying techniques or decision processes. All participants were guaranteed anonymity and understood the importance of not revealing the scenario to succeeding crews.

Results

The study was a specific attempt to investigate performance and error rates under high workload conditions. The error rate on the high workload leg was about 2.5 times greater than on the first sortie. Error rate was not a function of time, but was logically considered a function of workload level.

- Navigation Errors: Selecting the wrong frequency for the required navaid, selecting the wrong radial or heading, failing to select a navigation facility at the correct time, and misreading charts.
- Communication Errors: These concerned the use of communication radios. They included selecting the wrong frequency, not replying to a clear message, misunderstanding the message, using the wrong call sign, and forgetting to comply with a previously acknowledged message.
- System Errors: Mishandling engine, hydraulic or fuel systems, misreading and missetting instruments, and failure to use ice protection.
- Flying Errors: Most of these involved engine handling, neglect of speed limits, and flying at the wrong altitude. Sometimes the captain and first officer did not formally exchange control of the aircraft and these occurrences were included under this heading.
- Tactical Decision Errors: These concerned the amount of fuel dumped to achieve a desired landing gross weight that was compatible with the adverse runway conditions. Errors were also made concerning the interaction between the landing gross weight, the flap setting, and the degree of automatic braking selected.
- Crew Integration Errors: These included episodes where the captain failed to realize that the FO or FE were overloaded and asked them to retrieve information, further degrading their performance. There were also failures to use the autopilot when this could have helped reduce the workload.
- Flying Skill Errors: These occurred when the pilot flying was unable to control the aircraft to the parameters that he desired, as distinct from

"Flying Errors" where the pilot was successfully controlling the aircraft, but to the wrong parameters. These included failing to maintain the desired speed by 20 knots with the aircraft clean or 10 knots in the approach configuration, overbanking in a turn, failing to hold the desired altitude within 250 feet, etc.
- Automatic Flight Control Errors: These occurred when, in the opinion of the observer, the automatic flight controls should have been used to improve crew integration and reduce workload or when the autopilot was incorrectly used.
- Other Errors: A mixture of events, such as not briefing passengers about turbulence, difficulty in organizing charts and approach plates, and problems in handling eye glasses.

The main differences between the numbers of errors made in the first and second sorties concerned tactical decisions, systems operation, and navigation. This was expected because the circumstances of the first leg required few decisions, whereas many had to be made on the second. Similarly, on the second flight the engine shutdown and subsequent fuel dumping procedures provided the opportunity for more

errors in systems operations. The need to turn back after the engine shutdown involved navigation that had not been planned before flight, inducing the difficulties associated with diversion.

Resource Management

In analyzing the data gathered, large variations were apparent in the effectiveness of leadership, resource management and decision-making among the 18 captains.

Resource management is the use of both the people and things available to resolve a problem. The study quantified this ability. For instance, it is possible to observe the ways in which information for problem solving was obtained. Large differences were seen, varying from the meticulous confirmation of remembered information by reference to documents, to the use of preconceived values that were not checked. In some instances this assuming kind of behavior led to the need for later reappraisal and changes in decisions, thus prolonging flight time and actually increasing the workload during critical stages of flight.

Sometimes, while the crew was discussing the best course of action among themselves, it was difficult to determine whether the captain or first officer was in control of the aircraft, even at times when no autopilot was available. This behavior was most often noticed when either pilot was searching a chart or approach plate for navigation fixes and frequencies and sought help in this effort from the other pilot.

Another poor use of human resources was failure to anticipate the overloading of a crewmember by certain combinations of circumstances. For example, some captains didn't recognize the implications of fluid depletion in number three hydraulic system. With this they lost the remaining autopilot. This increased their workload, especially when they were hand-flying the aircraft themselves while continuing to make all the decisions. When captains were aware of the situation and delegated control to their copilots, immediate benefits were evident. They were then able to give full attention to assimilating the information from documents, ATC and other crewmembers, and then make unhurried decisions.

Great differences were also observed in the way decisions were arrived at by captains following the clog of the oil filter on number two engine. Some of the captains analyzed the situation quickly, and within seconds had realized the need to shut down the engine, which would require permission from ATC for a lower altitude. They immediately recognized the need to land at the nearest suitable airfield and began to assemble the information about weather and runway conditions that would enable them to work out the correct landing gross weight and the amount of fuel they needed to dump.

On the other hand, there were occasions when the decision to shut down the engine was delayed for several minutes, resulting in vain attempts to maintain altitude at the expense of speed or overboosting the remaining engines. In some cases the landing gross weight was determined without reference to information concerning the particular landing runway.

Conclusions and Recommendations

In attempting to be both brief and as comprehensive as possible in presenting the synopsis of a rather complex study, we have singled out these final thoughts from the report.

The results of this study indicate that high workload can lead to decreased performance of flight crews. This decrease is manifested by errors in the operation of systems and mistakes in navigation that are associated with prolonged response times to aircraft abnormalities.

Some of the difficulties are induced by deficiencies in the design of flight decks and instrumentation, others by the format of documents and charts. Many of the problems, however, relate to the management of human and mechanical resources. The variability between crews in reacting to the same problems suggests that those who perform less well might be helped by special training.

The report recommended that aircraft and equipment manufacturers apply human-factors engineering in the design of flight decks and instrumentation; that increased effort be given to redesigning documents and charts; and that special training in cockpit resource management be developed and used. Such training should include the use of realistic full-mission simulation scenarios. Special emphasis should be given to situations where rapid decisions and accurate solutions for operating problems are required for safe flight.

The research experiment described in this article, was proposed and conducted by Mr. H.P. Ruffell-Smith of the NASA Ames Research Center, Moffett Field, California and is adapted from a synopsis published in Eastern Airlines' Flight Line. *—Ed.*

FROM BOTTLE TO THROTTLE

by Lt Col Nathaniel E. Villaire
Commander, 1913 Communications Group
Langley AFB, Virginia

Alcohol is probably the oldest drug known to man and has been produced in various quantities and qualities virtually in every society that has left a recorded history. The ancient Egyptians used it, the Greeks glorified it, and the Romans made it a center of social attention. Used and abused as it is, alcohol is an integral part of contemporary society.

We need not belabor the many examples of intoxication evident around us. We've all seen cases ranging from a slightly flushed face to a staggering, slobbering stupor. Let's get down to the hard facts involving alcohol and the professional aviator. We need to consider its immediate and long-range effects, and dangers involved in its use.

Considering immediate effects, let's look at the flyer over in the corner—the one rolling dice and taking his (or hers) "on the rocks." As our drinker tilts the glass the following sequence of events takes place:

•Alcohol in the form of scotch, gin, white lightning, etc. enters the body producing oral, throat, and stomach "warmth" which is perceived as "mild" or "smooth." Eyes may water slightly.

•In the stomach little alcohol is absorbed. Eating proteins (steak and eggs, etc.) inhibits passage to the intestine. Protein must be partly digested first. Drinks with carbonation (soda mix, beer, champagne, et al) speed passage to the intestine.

•In the intestine, alcohol is absorbed rapidly, constantly and completely.

•The blood system distributes the alcohol fairly uniformly except in the brain and spinal fluid where it takes more time for the concentration to rise or fall.

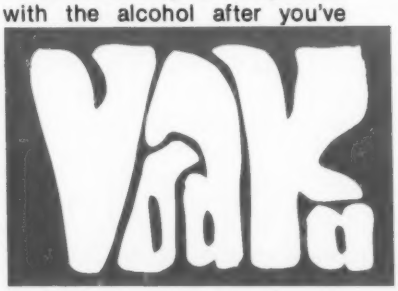
•Virtually every other part of the anatomy absorbs some alcohol. The chemical interferes with the intake and use of oxygen by the cells resulting in hypoxia.

Would you believe collapse right here on terra firma from our old enemy, hypoxia? Well maybe not from just one ounce, but have you ever seen a high roller stop with just one? Perhaps you may know an exception. In any case, hypoxia *is* the end result when body tissues are poisoned by the drug alcohol, and deprived of oxygen. In medical terms, it's called "histotoxic hypoxia," a fancy name for getting drunk.

Do you remember some hypoxia symptoms from your last chamber flight? How about dizziness, tunnel vision, hot and cold sensations, personality changes, deteriorated motor skills? Just as your ability to fly effectively is hampered or destroyed by hypoxia at altitude, your ability to place one foot in front of the other while on the ground under the influence of histotoxic hypoxia is similarly affected.

Unfortunately the similarities between altitude hypoxia and histotoxic hypoxia (alcohol induced) end there. You can treat altitude hypoxia successfully with 100 percent oxygen, but it won't help the histotoxic type. Although there are few, if any, after effects from altitude hypoxia, the consequences of abusing your body with alcohol are absolutely miserable. ("I feel like I'd have to get better to die.") One allows you to continue working after treatment with oxygen; the other allows you to have a severe headache, bloodshot eyes, nausea and poor coordination for hours and hours. You may not be a competent flyer for a long time after a bout with the bottle. The Air Force tradition of "twelve hours from bottle to throttle" may or may not be enough time to entirely overcome the effects of alcohol.

Here's what your body does with the alcohol after you've

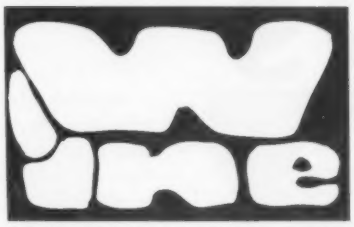


ingested it. It is transported through the blood to the liver where it is slowly detoxified. This happens at a rate of about one ounce every three hours —an important figure for you to remember. The amount of pure alcohol in liquor is shown by the "proof." Booze that is 100 proof is 50 percent alcohol. Thus, a martini (Terrorific 'tini for MAC crews) made with two shots of 94-proof gin contains almost a full ounce of alcohol.

Assume Colonel J. Daniels drinks 2 ounces of alcohol (four whiskey-and-waters). It will take about 6 hours before all the alcohol is eliminated from the colonel's body.

Maj Beefeater drinks 5 ounces of alcohol (5 martinis). Even with his liver detoxifying as fast as it can (0.33 ounces per hour), it will take about 15 hours for him to get all the alcohol out of his system. However, after 12 hours he may be legal to bend the throttles, but he is still "under the influence." If he's working with a 10-hour "bottle-to-brief" rule, his preflight planning may not be too pure either.

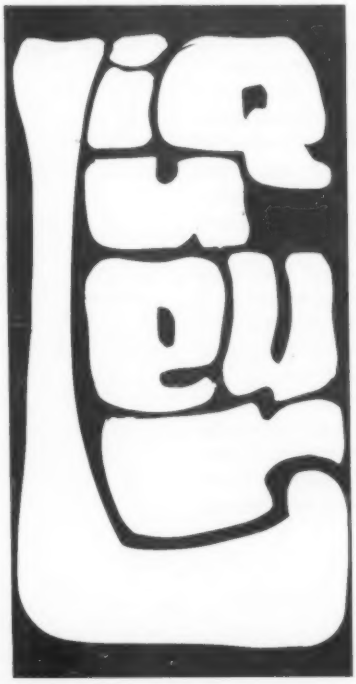
Additionally, according to recent research, the total effects



of alcohol consumption may not wear off until 14 or more hours after the chemical has been consumed. Reaction times and reflexes can be adversely effected enough to register a measurable difference up to 14 hours after drinking 2 to 3 ounces of alcohol.

Is the danger real? You know it! You probably know of crewmembers who shouldn't have flown in the "condition" they were in. We've seen folks bending their elbow at the bar late in the evening when they had a pre-dawn show time—but not too often, thankfully.

You have two obligations as a MAC aviator. First, you must control your own alcohol use. If



you are allowed 10 hours from alcohol consumption to show time for your flight, then you must discipline yourself not to consume more than 3 ounces of alcohol. Your body will metabolize those 3 ounces of booze in about 9 hours, leaving you "alcohol-free" when it's time to start preflight duties. Keep in mind that limiting your use of the drug alcohol to the amount your body can detoxify in a given time before flight does not guarantee that you will be entirely free of all its debilitating effects or that you will not become physically and psychologically dependent on the chemical. It simply means you will not be *legally* under the influence when it's time to go fly.

Second, you have a legal and moral obligation not to fly with crewmembers who are under the influence of any drug, including alcohol, not prescribed by a flight surgeon. How you handle the situation when a fellow flyer appears "drunk" has too many variables to set down hard rules, but the requirement not to allow that person to endanger your life, and the lives of other people is absolutely clear.

You are judged as a professional aviator by your training, discipline, and deeds—not directives. Know why there are rules, and the limitations of both the rules and your body. Beware of "twelve hours from bottle to throttle."

Lieutenant Colonel Villaire wrote this article for TAC Attack *back in 1972 when he was a physiological training officer at Langley AFB, Virginia. We updated some of the numbers based on more recent studies, especially those about the surprising amount of time it takes to "completely" recover from alcohol poisoning.—Ed.*

FLYERS ANONYMOUS

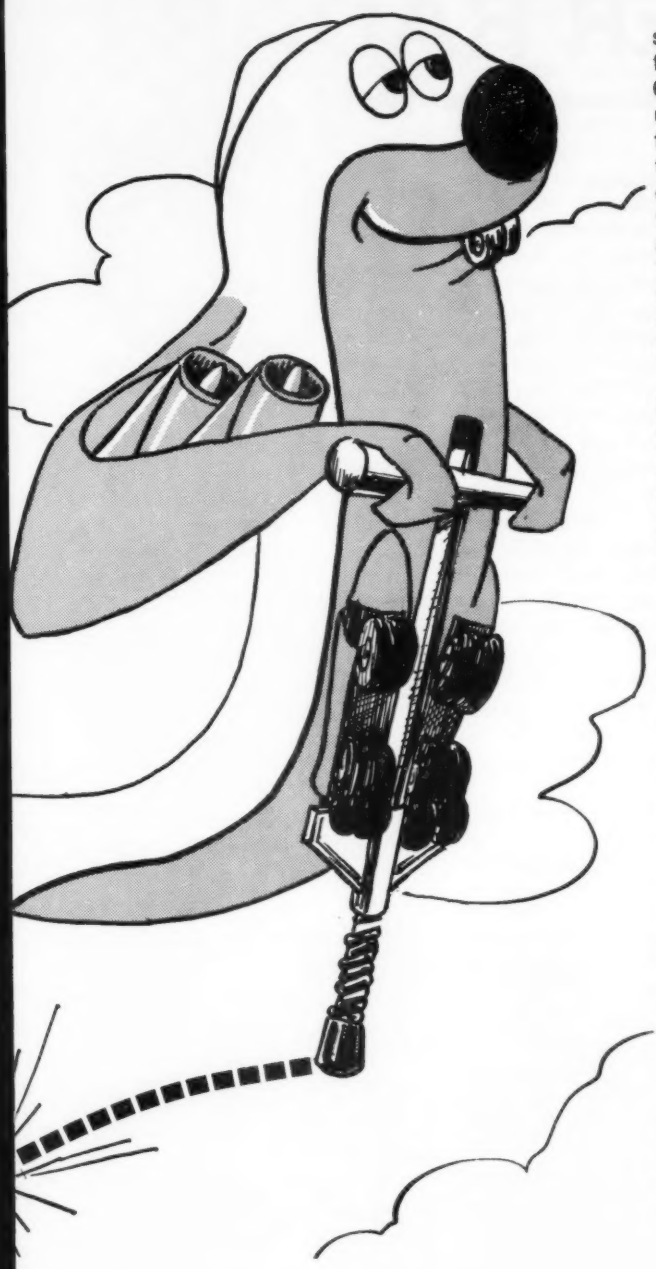
This month's Flyers Anonymous features several reports of altitude deviations taken from NASA's Aviation Safety Reporting System. They were submitted voluntarily by the aircrew members or air traffic controllers involved and each contains a valuable lesson for MAC aviators.—Ed

First from an airline crew: "Approach control cleared us to maintain 4,000. We called 'out of eight for four.' As we were going through 5,000 the controller said we had been cleared to maintain 6,000. He then told us to continue on down to four. This is not a CYA report [cover your anatomy]. My A is already C'd because I had the cockpit voice recorder tape removed and played it back for my supervisor. It turns out that we *really* were cleared to 4,000. I don't know what caused the controller's mistake. Altitude busts are becoming epidemic! I am going back to writing down every altitude change. I stopped doing this when we got altitude reminders in the airplanes."

An air traffic controller reported: "A small transport filed for FL 260 on an eastbound flight. When the aircraft was handed off to me [working the high sector], I assigned FL 250. The pilot acknowledged, 'Flight level two-five-zero.' I later observed mode-C readouts of 252, 257 and climbing. I asked the pilot his altitude. He responded, "Flight level two-six-zero," which by some strange coincidence was what he filed. I advised him that he was cleared to FL 250 and FL 260 was a wrong altitude for his direction of flight. He apologized and descended to 250. No problem, thanks to the computer and mode-C readout. But, had we been using the back-up radar system with no computer and no mode-C, who knows what evil may have lurked? Advisory to all pilots: Just because you file for it, don't *assume* you're gonna get it!"

Another airline crew reported they were "cleared to cross the 40 DME fix at 13,000 feet. The descent was started in plenty of time. During the descent, the old-style autopilot allowed the rate of descent to shallow out to less than our company-approved profile, resulting in the aircraft crossing the 40 DME fix at 19,000 instead of 13,000. This is a characteristic of this equipment and must be watched carefully by the pilot. It was not caught in this case because both the captain, who was flying, and I [the first officer] were distracted trying to get the latest basketball score for a group of fans in the cabin. The use of the newer autopilot or more attention to flying the aircraft by the crew would have prevented this incident."

These kinds of altitude deviations are obviously the result of human errors. Each reporter had the insight—or hindsight—to name a preventive



solution. The controller's error of clearing the flight to 4,000 and believing they were cleared to 6,000 was a straightforward mistake that went undetected when the aircrew properly read back the erroneously issued clearance. More attention to "hearback" is the solution. In the second incident, the center controller spotted the problem when he observed that the pilot must have assumed he would be cleared to his filed altitude. This kind of "mind set" has contributed to more than one accident. Distraction from the basic task of flying the aircraft was the cause of the third incident and the solution *is not* a better autopilot.

Two other reports point out a different altitude problem. From an ATC controller: "Aircraft 'A' departed with clearance to climb and maintain 7,000 feet. Aircraft 'B' at 8,000 feet was head-on traffic. I issued traffic advisories to both aircraft. When the aircraft passed each other, 'A' complained about the separation. Investigation revealed that 'A' had incorrectly set his altimeter to 29.40 when the area altimeter was 30.40."

And from the pilot: "We departed IFR to climb to 7,000. Center advised opposite direction traffic at 8,000, 15 miles. Leveling at 7,000, traffic was spotted, but seemed low. Traffic passed off our left side at apparently the same altitude, approximately one mile. Queried Center as to his altitude, they confirmed he was assigned 8,000. Other aircraft confirmed 8,000 with an altimeter of 30.40. The altimeter setting was the culprit—or more properly, the altimeter setter. The last time my aircraft had flown, the altimeter setting was in the lower 29's. On preflight both altimeters were set to what was thought to be field elevation, but instead were set 1,000 feet below field elevation—29.40. The uncontrolled airport's field elevation was about 500 feet above sea level, so the altimeters looked okay, but they didn't show that they were indicating 500 feet below sea level. Gotcha!"

This kind of altimetry error is easier to make than you might think. Since flying training, we have been warned to read the "whole" altimeter. Remember a 1-inch-of-mercury altimeter setting error equals a 1,000-foot altitude error, or to put it in mathematical shorthand: 1" = 1,000'.

WEATHER RADAR

What you see isn't necessarily what you get.

by Capt Robert H. Allen
Air Weather Service
Science and Technology Division
Scott AFB, Illinois

In my earliest days in the base weather station the weather radar was a mystical tool that told forecasters truthfully and exactly where the precipitation was in the local area. Later, as an aerial reconnaissance weather officer, I recall the navigator who wanted to drive our WC-130 just a little further before punching into the wall cloud of a typhoon because the wall looked a little weaker ahead on radar. In fact, we could've circled forever around that wall cloud without ever getting to that weaker return. Both the nav and I learned through experience that weather radars are just a tool which must be interpreted within their limitations.

In general, all weather radars (ground-based and airborne) normally fall within the wavelength operating range of from 1 to 10 centimeters. One other factor for consideration is that the beam width (which governs resolution of targets) is proportional to the wavelength divided by the diameter of the radar dish. To attain high resolution you need a small wavelength, a larger radar dish or both. All well and good, except the shorter wavelengths are much more susceptible to attentuation by precipitation or "washing out" than the longer wavelengths. For example, a 3-cm radar in a continuous moderate shower (2 inches per hour rainfall rate) may attenuate most of its signal within 10 miles. The airborne radar strives to maintain "fair" resolution by employing shorter wavelengths (usually 3 cm), but they may become practically useless in embedded showers and rain. Ground-based weather radars employ the longer wavelengths (5 or 10 cm), but have to go to much larger radar dishes (5 feet up to 30 feet) to maintain resolution. An ideal system would be a wavelength of at least 10 cm to negate most attenuation and a very large dish (over 30 feet in diameter) to maintain resolution.

Since neither the forecaster nor aviator enjoys such a system, we must understand the limits of what we see on the scope. The table below shows a comparison of the National Weather Service (NWS) radar, the Air Weather Service radar used at base weather stations, and a typical airborne weather avoidance radar.

Mr. Dale Sirmons at the National Severe Storms Laboratory, Norman, Oklahoma, has done considerable work on the actual and theoretical attenuation of various wavelength radars. Some results of his work are shown in Figures 1, 2, and 3. They show what you might see looking at three radars with different wavelengths scanning the same storms. Reflectivity intensity is shown in values of dBZ (reflectivity measured in decibels) with the heavier areas

Radar Comparison

Radar	Radar Wavelength	Antenna Diameter	Freedom from Attenuation	Beam Width at 50 nm
NWS WSR-57 (S-band)	10.6 cm	12 feet	Very good to excellent	2.1°/1.8nm
AWS FPS-77 (C-band)	5.3 cm	8 feet	Good to very good	1.6°/1.4nm
Airborne Radar (X-band)	3 cm	2.5 feet	Poor to fair	2.8°/2.5nm

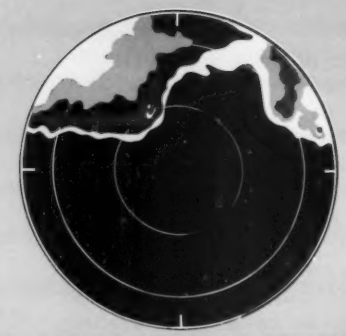


Figure 1. NWS radar display from S-band radar depicting a line of thunderstorms.

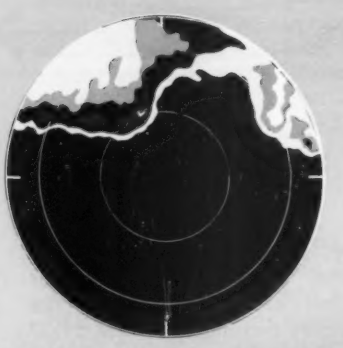


Figure 2. AWS radar display from C-band radar showing the same line of thunderstorms as in figure 1.

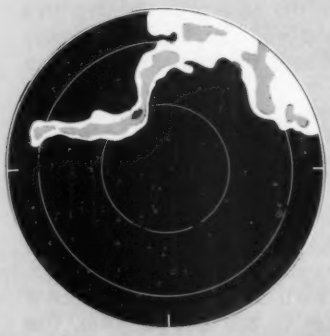


Figure 3. Typical airborne radar display from X-band radar depicting same line of storms as in figure 1.

(greater than 40 dBZ) shaded grey and the heaviest areas (greater than 50 dBZ) colored. The latter represents the areas of strongest convection. The S-band data were recorded by a NWS-type radar. The C-band and X-band data were computed from the S-band data using standard attenuation rates and they approximate well the problems observed with shorter wavelength radars. These problems include significant underestimation of the maximum reflectivity and a noticeable loss of return on the backside of the storm. The problems become much worse when you're already flying in precipitation.

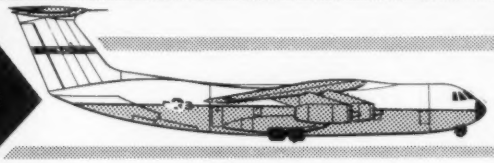
National Weather Service and some AWS radars provide most of the input for the national radar summary charts that are used in the base weather stations. FAA's Air Route Traffic Control Center radars can provide radar vectoring around thunderstorms and report precipitation coverage for the radar summary in some areas of the Western U.S. They do a good job considering they were not designed for weather surveillance. Air traffic control radars are designed to suppress clutter, which includes precipitation most of the time. Most center radars, operate around the 23 cm wavelength and have fan-shaped beams in the vertical covering from 0 to 45 degrees above the horizon. Such beams smooth out the large variations in intensity which are normally associated with stronger thunderstorms. Surveillance radars cannot determine the heights of thunderstorms or any other precipitation, and give only a fair approximation of intensity. If the moving target indicator (MTI) and circular polarization (CP), designed to minimize reflection from spherical targets such as raindrops, are in use, light rain, weak showers, and the periphery of thunderstorms will be blanked out. Controllers may hesitate to turn off MTI and CP when aircraft are within the ARTCC sector. A 1976 FAA Advisory Circular stated, "Pilots should also recognize that the controller's data are often far from complete due to the design of the radar and its location relative to the weather observed," and pilots "should *not rely completely* on air traffic controllers to provide weather information or to initiate radar vectors to aircraft for avoidance of severe weather, particularly when arriving and departing terminals or in holding patterns." Both pieces of advice are still sound.

Finally, a very small number of Flight Service Stations have a slave-scope radar display from the local NWS radar and may provide information on storm strength and coverage.

In summary, the best official weather radar information is provided by AWS and NWS radars. They are designed for detecting weather targets. Airborne radars are designed for weather avoidance, but they attenuate badly through heavy rain whether the plane is in precip or not. FAA radars can pick up the heaviest centers of convection and lighter areas too, if the radar is properly configured (MTI and CP off), but normally underestimate the maximum intensity and cannot measure tops.

If you plan to encounter IMC, don't hesitate to call for additional information from a ground-based radar before the situation gets hairy.

Getting It Down



Vertical navigation techniques ease enroute descents.

Suppose you're cruising along at FL 370 in your MAC airlifter headed for Scott AFB, when the center controller instructs, "MAC 83534, descend at pilot's discretion to cross 20 miles southwest of St. Louis at 7,000. St. Louis altimeter 30.01."

The copilot obediently reads back the clearance, looks at you and asks, "When do you want to start down, sir?"

Yep, my fellow MAC flyer, *you* are the "pilot" whose "discretion" the ATC controller, your fellow crewmembers and passengers are counting on to make a safe, smooth and fuel-efficient enroute descent. You check the DME and it tells you that you're 183 miles from STL so you know you probably shouldn't start down right now, but when? If you descend too early you'll end up grinding along at low altitude with the jet engines sucking in many gallons of fuel; if you start too late, it will be idle and drag devices to meet the altitude restrictions. On the other hand, if you figure it right you can make a smooth and efficient descent.

Techniques and formulas for computing descents vary greatly. Some are very simple (three times your altitude), some involve higher mathematics, and others are simply TOBAR (That Oughta Be About Right) techniques. AFM 51-37 provides excellent guidance for solving descent problems, but some of its techniques might require the use of a "circular computer" or a hand-held calculator. However, your E6B is back in your desk at the squadron, the battery in the copilot's calculator is dead and you don't have a handy USAF navigator on board this trip. So what are you gonna do, pilot?

Figure it in your head, that's what. We've got some easy-to-use mathematical techniques to help you. Please notice we didn't call them formulas because they aren't *that* scientific. First we'll determine your start-descent point, then we'll figure the required VVI, and finally we'll learn how to update our descent profile as we go down. For a smooth trip, we'll assume a 3° descent gradient which equates to 300 feet per mile. The same basic techniques will work for steeper or shallower descent gradients—4° gradient equals 400 feet per mile, etc.

Descent-start Point

To figure the point to start your descent you first subtract the target altitude (cleared-to altitude) from your cruise altitude and divide by 300. In the opening example, the numbers would look like this: $\frac{(37,000 - 7,000)}{300} = \frac{30,000}{300} = 100$ nautical miles required to descend. Then you add 20 to comply with center's crossing restriction and start down at 120 DME.

If you like to plan well ahead—always a safe move—you might want to compute your start-descent point based on reaching, 10,000 feet 30 miles from the final approach fix (FAF) or reaching FAF altitude no later than 5 miles from the fix. This is especially useful when you're preflight planning and you'd like to determine an approximate descent-start point. For instance, if the published FAF altitude is 2,000 feet and your cruise altitude is FL 370, the "ciphering" would look like this: $\frac{(37,000 - 2,000)}{300} = \frac{35,000}{300} = 116 \text{ nm} + 5 \text{ nm} = 121 \text{ nm}$ You would plan on starting your descent 121 miles from the published final approach fix.

Rate of Descent

Now that you've decided where to start down, you can control the rate of descent with pitch altitude and your speed with thrust and drag. Since descent speeds are often mandated by Dash Ones and operating procedures, vertical velocity (VVI) becomes the variable.

The higher your ground speed, the greater the VVI required to meet the 3° descent gradient, and vice versa. Step one is to figure your ground speed (GS) in nautical miles per minute (mi/min). If you have a ground speed readout (INS, doppler, navigator, etc.) simply divide GS by 60 to get mi/min. Another method is to multiply your indicated Mach number by 10 (0.7 Mach = 7 mi/min). You can then divide the number of miles required to descend by the ground speed in miles per minute and multiply the answer by—

"But wait!" you protest, "You said this was going to be simple."

Okay, there is an easier way. By using some mathematical tricks you can come up with the formula: $\text{VVI} = \frac{\text{Knots Ground Speed}}{2} \times 10$

So if the INS says 420 knots it works out like this: $\frac{420}{2} \times 10 = 2,100$ feet per minute VVI required.

As you descend, your true airspeed and ground speed will change, so it's necessary to recompute the VVI periodically (every 10 miles works well).

When starting your descent, it's good to recall that 1° pitch change will give you a descent rate approximately equal to your TAS in miles per minute times 100, or your Mach number times, 1,000. Thus, at 5 miles per minute (300 KTAS or 0.5 Mach) a 1° pitch change will yield a VVI of about 500 fpm.

Profile Altitude

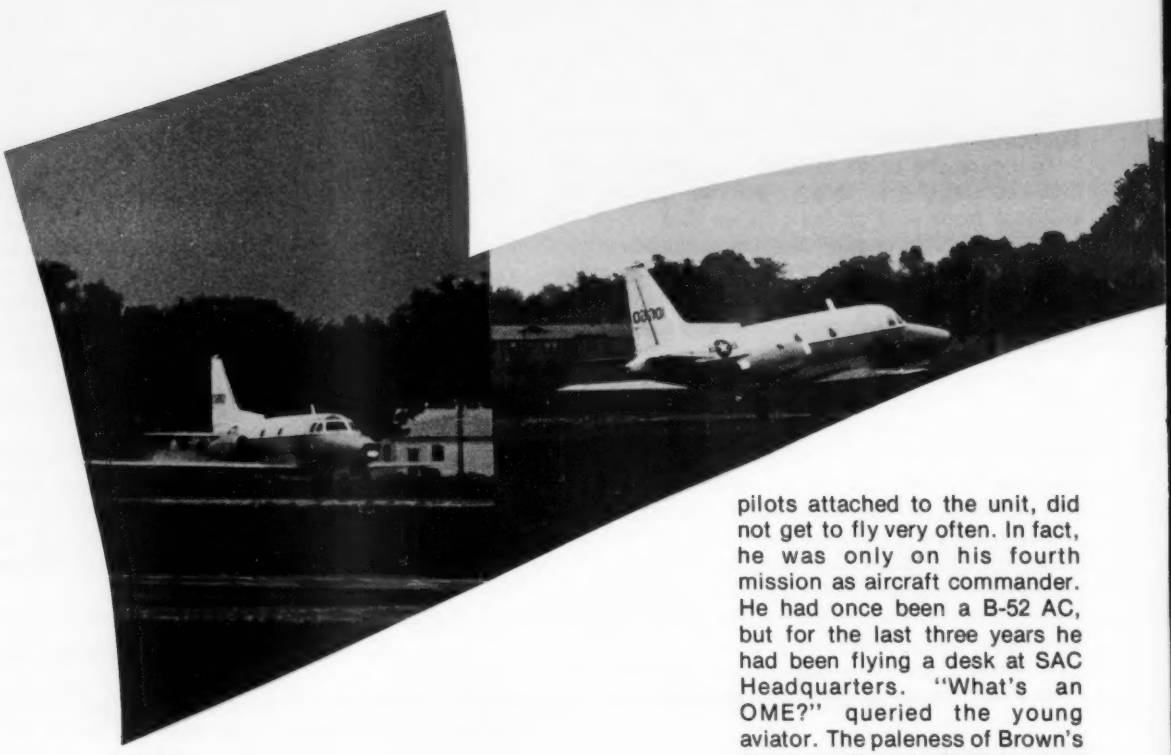
To cross check your progress you can multiply your distance-to-go by 300 and add the target altitude. Using the example descent to 7,000 feet by 20 miles southwest of St. Louis, at 50 DME you should be passing: (30 X 300) + 7,000 = 16,000 feet.

The Catch

A fairly obvious fault in this entire system is the requirement to fly at a maximum of 250 KIAS below 10,000 feet. If your MAC airlifter normally descends at speeds higher than 250 knots, then you will have to allow extra time and distance for a leveloff, or significantly decreased descent rate, as you approach 10,000 feet. The alternative is to use reduced thrust and increased drag—spoilers, speed brakes, etc.—to reduce your speed. A popular rule of thumb is to allow 10 extra miles for the slowdown—figuring this deceleration rate precisely does require some higher math.

Finally, you should consider the use of drag devices very carefully. Your aircraft uses the least fuel when descending in clean configuration with minimum engine power. Of course, you may have to use higher power settings that allow you to have cabin pressurization and use anti-ice systems, but generally the less power (i.e. fuel flow) the better. As a side benefit, not "dirtying up" the aircraft any earlier than necessary gives you and your passengers a quieter and smoother ride.

Think about using these techniques the next time you fly. They will help you conduct an efficient descent from altitude making your vertical navigation much more precise, smooth and safe—that's professional.



FIRST CHECK

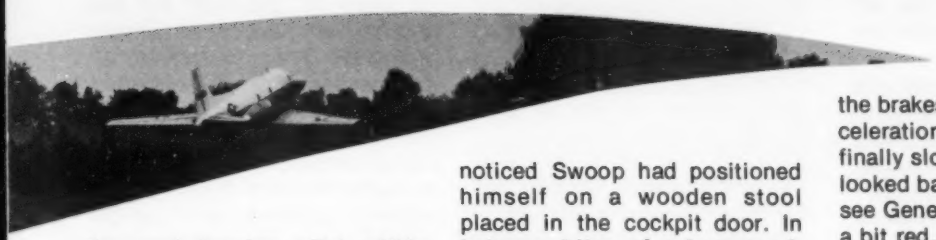
Flight evaluations examine more than technical skill and knowledge.

by 1st Lt Ted H. Minkinow
Det 1, 1401 MAS
Offutt AFB, Nebraska

"This is a no-notice OME," said a smiling Captain Sam Swoop, local chief of CT-39 stan-eval. Second Lieutenant Tod Bart didn't even know that "OME" meant operational mission evaluation he just knew that Captain Swoop had a reputation for bearing bad news. Fresh out of both UPT and the CT-39 training facility, this would only be Bart's third line mission.

"Pardon me, sir," managed the competent copilot with a voice that impressed even himself, "I'll inform the AC." Bart scurried out of the weather shop in search of his AC, Captain Art Brown, and found him among the foreign notams. Captain Brown, one of the many pilots attached to the unit, did not get to fly very often. In fact, he was only on his fourth mission as aircraft commander. He had once been a B-52 AC, but for the last three years he had been flying a desk at SAC Headquarters. "What's an OME?" queried the young aviator. The paleness of Brown's face confirmed Bart's worst fears. Yes, he thought, I'm about to embark on my first real MAC no-notice checkride. "By the way, sir," Bart added helpfully, "the weather at Andrews is great now, but they expect a band of thunderstorms to arrive about two hours after we get there."

The last statement eluded Brown's comprehension. "How could they do this to me?" he grumbled forlornly. This is Sunday, doesn't stan-eval ever take a break? he thought. And this copilot they stuck me with! I didn't even realize they allowed second balloons in the cockpit! I bet he doesn't know his tacan from his tailcone. And me, I haven't had a chance to get in the books since my upgrade two months ago! The lieutenant won't be much help; I'll just show Swoop that I can do it all by myself, despite the kid. Besides, he began to reason (as



the cool bomber pilot within reset his mind from frenzy to frantic), if I shine far brighter than my copilot, maybe Swoop will gloss over the knowledge items enough for me to fake it. Besides, passing the check is *all* that matters now anyway!

"Want me to get the takeoff data?" offered Lieutenant Bart.

"No," replied Brown, "I'll get that."

"How about the flight plan?"

"No thanks."

"The notams?"

"Nope."

"The navigation kit check?"

"Nein! I tell you what, Lieutenant, why don't you pick up the coffee and order three box lunches?" directed the AC while trying to sound bored. As the young pilot approached the door he passed a rather unimposing figure, Captain Sam Swoop, sitting in the corner munching an apple—the Captain smiled knowingly.

With the preflight briefing complete and the baggage loaded, the crew hopped on the van. "Plug in the coffee, jump in your seat, and wait for me to check the forms and complete the walk around," instructed Brown as he leaped from the still moving van. After a brief jostle with the sliding door, Tod managed to extricate himself from the bus. He unloaded the crew baggage, grabbed the coffee jug, and headed up the stairs of the Sabreliner. As the inexperienced copilot seated himself in the right seat, he noticed Swoop had positioned himself on a wooden stool placed in the cockpit door. In between bites of a ham sandwich, Swoop told Bart he was to pretend the evaluator was just a piece of cargo. Tod secretly wished he could lay Swoop across the back seat with the rest of the luggage. Soon General Johnson and a single space-A passenger arrived.

Brown clambered aboard after the General and took the DV's coat. As the AC gave his briefing, Johnson gazed stoically out the window. Briefing completed, Brown slid into the left seat and called for the before-starting-engines checklist. All went smoothly as both engines were started and the aircraft was taxied to the runway. "Tag 63, cleared for takeoff," called the tower. Out of the corner of his left eye Tod thought he saw Swoop smile.

"Line-up check!" barked Brown. Lieutenant Bart checked the antiskid, lights, pitot heat, and IFF-SIF.

"Complete," returned Tod after a look at the heading indicators. Power was advanced to the takeoff setting and a crosscheck of the gauges showed normal.

"Off at 0715," remarked Art as he released the brakes and the aircraft lurched forward.

"Sixty knots," called the copilot and the AC disengaged the nosewheel steering. Suddenly, the caution lights flashed, "antiskid inop." "Reject!" called the Lieutenant as the aircraft accelerated past 100 knots. Swoop braced himself as the pilot jumped on the brakes, causing a violent deceleration. When the Sabreliner finally slowed to taxi speed, Tod looked back at the pax in time to see General Johnson's face turn a bit red. A quick glance across the aisle caught Lieutenant Dressing, the space-available passenger, looking a little scared. Once clear of the runway and stopped, Swoop dropped an open 781 in the lap of the left-seater. Brown glanced down to see the words "ANTISKID INOPERATIVE" written in bold letters and circled with a red pencil. Lieutenant Bart flipped off the antiskid switch, wondering how mad the General would be over this needless delay and embarrassment. Brown got clearance to taxi back to the runway for another try at a takeoff as Captain Swoop retrieved the forms and smiled. Once airborne, the crew was able to relax a little, at least Bart did. Art, who in his own mind managed to blame his copilot for the runway incident, was wondering how Bart was going to mess up next. Consequently, every 30 minutes for the next couple of hours the AC demanded to know which radio Tod was working. "We're still on 'victor,'" came the reply each time. Then, as the flight approached Andrews, things began to happen.

"Put Andrews ATIS on the line," ordered Brown as the Sabreliner approached 175 miles out.

"Yes sir," replied the butter bar.

Since the voice was identifiable but weak, Bart turned the UHF squelch off, allowing the voice transmission, along with much static, to be heard. Tod

started to copy the ATIS but was stopped short when the AC grabbed his hand. "That's not critical since I'm listening also," explained Brown. Above the static, Bart could hear a lot of airline chatter coming over VHF, and Swoop again smiled knowingly.

The reason for the chatter soon became evident to Bart. "Sir, I believe that line of thunderstorms moved in a little sooner than expected!" he observed. The aircraft was descending through FL 310, with the DME reading 90 miles from Shawnee vortac.

"What?" blurted Brown as the band of weather suddenly appeared in the windscreen.

"Tag 63, level at FL 300," ordered the voice in their headsets.

"Get METRO on the line!" demanded Brown, "and put Andrews in the tacan!"

"The biggest returns look to be about thirty minutes away," explained the forecaster.

"Sir, if we request 330 we could get through between these buildups," offered the copilot, pointing to a clear area.

"Let's try it," decided the AC. "Put the ATIS back in UHF."

Tod made the request to Center and was told to standby. "Tag 63, climb and maintain flight level 330," returned the controller a few moments later.

"Sir, let's climb," suggested Bart.

"You made me miss the field temperature for the pax brief," snorted an annoyed Captain Brown.

"But sir!"

"Be quiet."

"Braniff 268, proceed direct Hartford. . . Tag 63, you climbing?. . .United 871, we have your request for diversion to Kennedy. . .Tag 63 state fuel on board," requested the controller as the AC finally tuned in.

"Two hours remaining," replied a frantic Brown into the Andrews ATIS frequency, as he advanced the power to start the climb.

"Tag 63 proceed to Lunky and hold," came the next jumbled transmission.

"We may have to go to Langley," decided the AC. "Go back and see what the General says."

"Tod slipped out of his seat and past Swoop, who wasn't smiling anymore. He explained the weather situation to General Johnson who looked as if he was near an overtemp. After a curt conference the young aviator retreated to the sanctuary of the cockpit. "The general says to get him on the ground" and Lieutenant Dressing says she wanted to go to Langley anway!" managed Bart in one breath.

The weather at Langley was "3,000 and 4," and there were no thundershowers. With the routing approved, the cockpit settled back to near normal. Captain Brown briefed the ILS approach and started his descent. Things were looking strangely dark, both in and under the clouds on final. The AC seemed to have the course and glidepath pegged when "Turn up the heat!" suddenly boomed over the interphone from the cabin. Tod reached for the manual temperature switch, but had his hand slapped away. "I'll get that!" growled the AC as he grabbed the rudder trim switch instead and fed in full right rudder trim. The aircraft yawed violently to the right, causing the General to bite down on his finger instead of the Rolaid he was just putting into his mouth.

As control of the aircraft was regained, tower announced, "Tag 63, braking action is reported as 'poor' by the C-9 on rollout."

"No sweat!" quipped Brown while at the same time, visions of doom danced in the Lieutenant's head.

"But sir, the minimum we can accept is 'fair,'" he pleaded.

"That's just for civilian fields," returned the AC.

"Better check," came the voice from between the seats.

After Brown went missed approach and got established in a holding pattern clear of the weather, he dug through his publications looking for the RCR restrictions. After an unproductive search through 60-16 and the Dash One, he finally

Third Place, 1981 MAC Flying Safety Writing Contest

opened AFM 51-37.

"I can't take anymore of this!" exclaimed the frustrated evaluator. "The restriction is in MAC Regulation 55-39, and as long as I'm on board, we will not land at an airport where the braking action is reported less than our minimums."

The approach controller interrupted Captain Swoop, "Tag 63, Norfolk Approach, Langley reporting an RCR of one-three."

"Get out of the seat, Brown," ordered the stan-eval Captain, "I'm taking over command of the aircraft for safety of flight."

The chastized AC reluctantly transferred control to the young right-seater with instructions to keep them in the holding pattern and then vacated the left seat. Once strapped in, Captain Swoop assumed control and flew a flawless ILS to a firm wet-and-slippery landing. The taxi-in was very quiet.

"Reject!" called the Lieutenant as the aircraft accelerated past 100 knots.

Tod dutifully read off the engine-shutdown checklist items," Brakes."

"Holding," responded Captain Swoop.

"Throttles."

"Off," acknowledged the evaluator who then directed the copilot to go help the passengers deplane while he finished the checklist. Bart would rather have faced reverted-rubber hydroplaning than the two passengers in the back.

"Gimme my hat!" ordered General Johnson. "I'll be only four hours late if I'm lucky," he added as he glared at the crewmembers.

"I can get my own luggage, thank you!" said Lieutenant Dressing when Tod offered to hand it down to her.

"Have a nice weekend!" Bart called as the visibly shaken lady boarded the passenger bus.

The return trip had no duty or space-A pax so Swoop decided to use the time to debrief the crew. The examiner took the right seat and let Tod fly after reaching cruise altitude. "Well, you blew it!" was his first comment to Brown who was standing in the cockpit doorway. Bart sat and listened as Swoop explained the evaluation to Captain Brown. Several key words were repeated time and time again—safety, professional, competence. Swoop started with the lack of crew coordination leading to both missed weather and maintenance write-ups. Clearances were ignored because the AC was trying to run all of the radios himself. The possibility for disaster could have been much greater had the AC grabbed the rudder trim in the soup. A clear understanding of directives would have precluded the attempt at landing the aircraft on a runway where the RCR was reported out of limits. Bart heard Swoop say that it all added up to a casual attitude which caused discomfort and danger to passengers, a completely botched airlift mission, and more importantly, the possibility for a serious mishap, and that was unacceptable in any command. Brown was fuming indignantly—and silently—as Swoop turned to Tod and said, "Your grade is Q-1. Come to my office tomorrow for the debrief."

Brown looked at the copilot and remarked, "At least you passed. Remember, that's all that matters anyway." Even though Tod pretended not to hear, the words made him think. Passing a check ride can never be more important, he reasoned, than safely accomplishing the mission. The most important outcome of a check, as Tod now saw it, was not the qualification, but rather, the pilot's attitude toward the job of flying. He had seen how potentially fatal a cursory knowledge of systems and directives could be, and how the problems seem to multiply when the "crew concept" is ignored. Suddenly, Swoop didn't seem to be such a bad guy after all. The Lieutenant glanced over at the evaluator and Swoop smiled. Tod had learned a lot on his first no-notice check.

ABOUT THE AUTHOR

Lieutenant Ted H. Minkinow is a 1979 graduate of the Air Force Academy where he majored in history and political science. After pilot training at Columbus AFB, Mississippi, Lieutenant Minkinow was assigned to Offutt AFB, Nebraska where he currently serves as a CT-39A pilot.

Preparing for the

Mental "keys" can help you prepare for emergencies.

Think back to your last checkride. Remember how well you handled the engine-out work? You were primed and ready for it because you knew it was coming. How about your last simulator ride? Systems classes and studying had you primed and ready for emergencies. By the end of the week you felt as if you owned that C-130. It's the kind of feeling you want to have every time you strap in—primed and ready for anything that "Old Herk" can throw at you. Yet we can all recall malfunctions that caused confusion in the cockpit, discussion as to the correct Dash One procedure, or even completion of the wrong procedure. Being caught off guard, surprised, or suddenly faced with a stressful situation can lead people to act before they think, increasing the probability of a wrong action or a failure to recall "caution" or "warning." No one is perfect. Mistakes happen on checkrides and in the simulator and should be considered a learning experience. But the real test is how well you perform during an actual emergency on a mission when there is little margin for error.

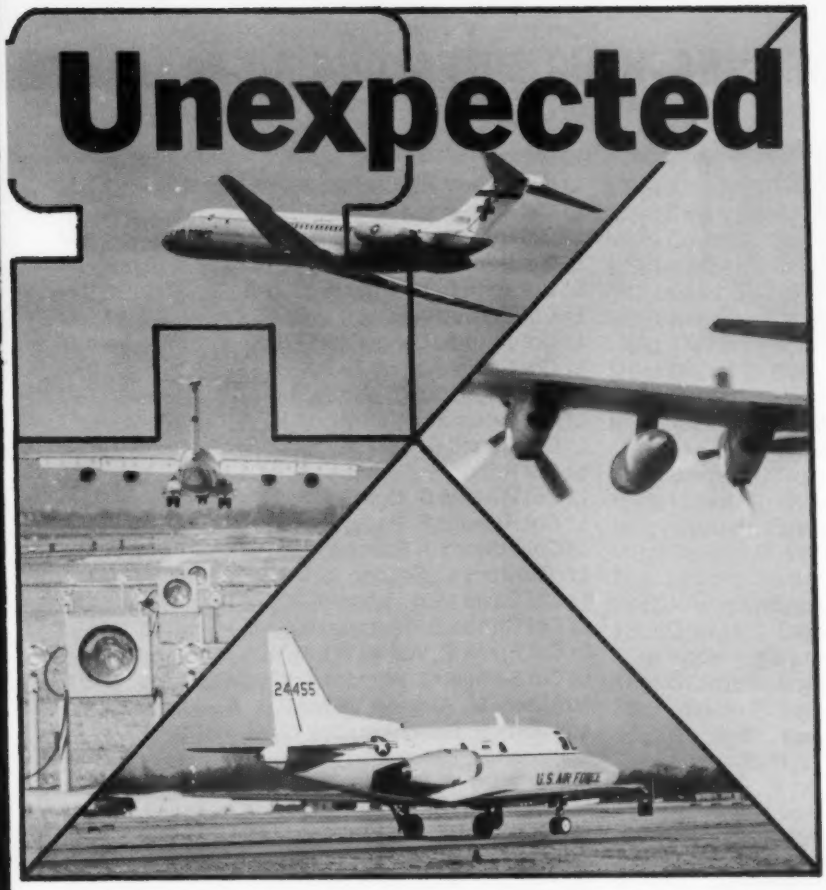
Of course, the best preparation is through knowledge of the systems, the limitations, and above all the emergency procedures in Section III of the Dash One. There is a basic learning premise that says the longer the time period since your last review of a piece of knowledge the longer it takes to recall it and the greater the probability of incorrect recall. A strong belief in Murphy's Law should be the basis on which every crewmember develops a personal program for "keeping up to speed." Being out of phase for a checkride is no excuse, and neither is laziness—although it may be a reason.

There is a technique that can be used on the aircraft which can help you keep alert, avoid complacency, and at the same time minimize reaction time and maximize the chances of performing the correct emergency procedure. It requires some mental discipline but demands very little time. Divide the flight into seven phases: start, ground operations, takeoff, after takeoff, inflight, approach and landing. Each phase has associated malfunctions that are peculiar to it, are more likely to occur than others, have given you trouble in past simulators, or are malfunctions you know would give you the most trouble if caught unprepared. The use of mental "keys" can trigger thinking about certain critical events and emergency actions for that phase of the mission.

Here is how it can work. During start, only two malfunctions require the starter button to be held in for a stop start, negative de-enrichment and torching. Your hand on the starter button is the key that triggers you to keep those malfunctions in the back of your mind. Completion of the starting-engines checklist keys the ground phase. A quick mental review is in order—uncontrollable high TIT is ground stop, not feather; agent is not required if the light goes out on a nacelle overheat; ground evacuation; copilots prepare for brake failure, etc. Calling for the lineup check should key abort procedures. How will you handle a high-speed abort?

The word "go" should key you to be ready for two of the most critical takeoff emergencies. Expect outboard engine failure. Flight control inputs, airspeed requirements, and obstacle clearance flash through your mind instantly. It can also key the second emergency—prop malfunction. Would you remember that the very first thing to do before anything else is attain two-engine minimum-control speed?

"After-takeoff checklist complete" begins the inflight



phase. Certain airborne malfunctions other than boldface require immediate actions before any reference can be made to the checklist or Dash One. Examples are electrical fire, essential AC bus failure, inflight door warning, and rapid decompression. Think about the initial procedures for each.

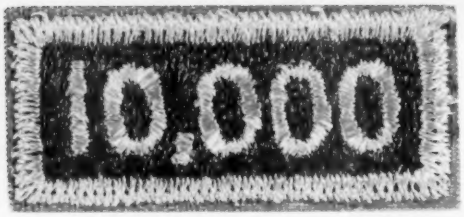
The call for the descent checklist begins the approach phase. Planning and thinking ahead are essential. Any three or two-engine approach and landing will have a pilot's mind going a mile a minute, but on a normal approach you cannot become complacent—and don't let your copilot go to sleep either. The right-seater's hand on the flap lever should key three things: hand stays on the flap lever until the flaps reach the desired position; watch the indicator and hydraulic pressure; prepare for a malfunction. For a rapid utility system pressure loss the copilot should back up the flight engineer (who will pull the wing flap control circuit breaker) by quickly shutting off the utility system pumps. Split flaps in a tactical downwind pattern can roll you into the ground. The call, "gear down," should also alert the copilot for a rapid system pressure loss. Bring the handle back up immediately. These malfunctions don't happen often, but if you are caught unprepared they can ruin your whole day.

The landing phase is the other most critical phase of flight. How will you handle losing an engine on short final? After landing, as your throttles reach flight idle, key yourself for directional control problems as you bring the throttles into the ground range and reverse. An outboard propeller remaining in the flight range during a short-field landing will force you off the runway in seconds if you don't catch it before using reverse. Throttles to ground idle. Nosewheel steering. Engineer calls out the bad engine. Feather. It will pay to be ready. The ground phase begins again as you pull off the runway. Remember, there's no excuse for dinging a wing, even if you do have a nacelle overheat indication so keep your eyes moving until the aircraft is in the chocks.

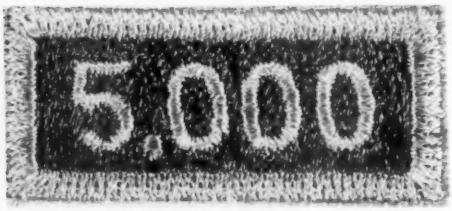
In conclusion, all pilots should have a system to keep them alert and ready for malfunctions. Keying to phases of flight is only one technique. Use whatever works for you and you will be better prepared for those Hercules surprises. Also, there is hardly any emergency in a multiengine aircraft that will kill you if you're prepared and fly the airplane.

Even though this article is directed specifically toward C-130 pilots, similar techniques can be used to enhance the safety and professionalism of all MAC crewmembers, regardless of the type aircraft. It always pays to be prepared.—Ed.

MAC INDIVIDUAL FLYING-HOUR MILESTONE AWARDS



Col Kenneth R. Hesse, 1 MAS
Lt Col William T. Gernhardt, 58 MAS
Lt Col Peter L. Magazzu, 702 MAS
Lt Col James B. Work, 8 MAS
Maj Alvin D. Moore, 707 MAS
CMSgt James M. Barron, 707 MAS
CMSgt Dudley G. Hicks, 14 MAS
SMSgt Jesse M. Cope, 6 MAS
SMSgt David P. Moskowitz, 702 MAS
MSgt George B. Dickson, 6 MAS
MSgt Nicholas D. Ferguson, 180 TAS
MSgt Robert S. King III, 301 MAS
MSst James L. Sommer, 180 TAS
MSgt George A. Thomas, 301 MAS



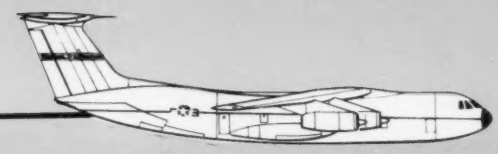
Lt Gen Kenneth L. Tallman, Supt, USAFA
Brig Gen Jerry W. Cochrane, HQ NCANG
Col Larry D. Wright, 438 MAW
Lt Col William L. Allen, 156 TAS
Lt Col William G. Bouni, 166 TAG
Lt Col Harold R. Cadmus, 145 TAG
Lt Col Michael J. Danbury, 326 MAS
Lt Col William W. Didlake Jr., 704 TAS
Lt Col John D. Edrington Jr., 908 TAG

Lt Col Robert H. Fischer, 702 MAS
Lt Col James A. Gault, 301 MAS
Lt Col Robert W. Harris, Det 4, 1401 MAS
Lt Col Bernard L. Hothem, 18 MAS
Lt Col John E. Kellmann, 68 TAS
Lt Col Edward A. Klein, 22 MAS
Lt Col John A. Long, 345 TAS
Lt Col Carl Melin, 50 TAS
Lt Col Augustus C. Moran, 4 MAS
Lt Col Jerome L. Nelson, 18 MAS
Lt Col Gerald B. Olender, 102 ARRS
Lt Col Robert E. Park, Det 3, 1401 MAS
Lt Col William S. Quigley, 30 MAS
Lt Col Richard F. Rader, Det 4, 1401 MAS
Lt Col Edward J. Roeckel, 102 ARRS
Lt. Col Jerry L. Sailors, 20 MAS
Lt Col David M.H. Sibbald, 709 MAS
Lt Col Clifton E. Tourangeau, 4 MAS
Lt Col Frank B. Wells, 710 MAS
Lt Col Samuel G. Woodrow, 920 WRG
Maj Larry M. Almand, 30 MAS
Maj John S. Bouchard, Det 10, 37 ARRS
Maj John H. Brooks, 15 MAS
Maj Edward M. Colwell, 326 MAS
Maj Jesse M. Deal, 145 TAG
Maj Gordon W. Dobson, 702 MAS
Maj Bernard S. Fabian, 911 TAG
Maj John H. Francis, 1400 MAS
Maj Milton T. Gerock, 145 TAG
Maj James E. Haight Jr., 102 ARRS
Maj Robert A. Henshaw, 702 MAS
Maj John E. Hockenberger, 911 TAG
Maj Jerry L. Hurst, 708 MAS
Maj John A. Kent, 4 MAS
Maj Jerome C. Kinder, 305 ARRS
Maj David L. Lamphron, 702 MAS
Maj Frederick W. Lindahl, 731 TAS
Maj Clark E. Marshall, 33 ARRS
Maj David H. Matteson, 704 TAS
Maj Teddy D. Moore, 68 TAS
Maj James V. Nottoli, 158 TAS
Maj Ernest T. Randall, 30 MAS
Maj Franklin P. Ritchey, 729 MAS
Maj William W. Schell, 166 TAG

Maj Conrad P. Skladal, 64 TAS
Maj Anthony Tassone Jr., 702 MAS
Maj Floyd M. Thimling, 702 MAS
Maj Roger R. Wallis, 704 TAS
Maj David R. Waxman, 436 ABG
Maj Paul S. Welsh, 1 MAS
Maj David N. Wilkinson, 702 MAS
Maj Clark S. Young, 18 MAS
Capt Daniel K. Duffey, 18 MAS
Capt George R. Fourchy, 301 MAS
Capt Thomas J. Grenham, 337 TAS
Capt Dante A. Mazzochik, 337 TAS
Capt William C. Schillig, 911 TAG
Capt Michael J. Tracy, 708 MAS
2d Lt Hank L. De Voll, 1 HS
CMSgt Charles T. Jackson, 30 MAS
CMSgt Harold J. Powers, 702 MAS
SMSgt Peter L. Adels, 6 MAS
SMSgt Miguel P. Cadiz, 9 MAS
SMSgt Paul Harvell, 30 MAS
SMSgt William R. Meeler, 57 MAS
SMSgt Albert A. Nash, 30 MAS
SMSgt Hugh R. Zimmer, 30 MAS
MSgt Van A. Adrian, 30 MAS
MSgt Juan Benitez, 102 ARRS
MSgt Charles R. Burdes Jr., 702 MAS
MSgt Leon C. Clark, 18 MAS
MSgt William G. Denton, 21 TAS
MSgt Ronald E. Dupree, 57 MAS
MSgt Irving Eisenstein, 732 MAS
MSgt Joseph R. Feltner, 9 MAS
MSgt Clarence L. Fisher, 76 MAS
MSgt Kevin G. Foulois, 6 MAS
MSgt James A. Goldsworthy, 62 TAS
MSgt Donald W. Harris, 1 MAS
MSgt Bryan P. Hutchison, 57 MAS
MSgt Leonard W. Kaminski, 20 MAS
MSgt John B. Kephart, 180 TAS
MSgt Roger L. Lambeth, 166 TAG
MSgt Edward J. Loftus, 18 MAS
MSgt William E. Mahoney III, 707 MAS
MSgt Allen J. Miller, 326 MAS
MSgt Robert L. Newell, 4 MAS
MSgt Bernard L. Palmer II, 1 MAS
MSgt Arthur J. Parnham, 6 MAS
MSgt Charles I. Penn, 55 WRS
MSgt Cavazos Raul, 68 TAS
MSgt Kenneth H. Roberts, 156 TAS
MSgt Larry E. Rowen, 75 MAS
MSgt Harvey H. Simmers, 18 MAS
MSgt Theodore J. Soltowski, 702 MAS
MSgt Gerald E. Staiger, 702 MAS
MSgt Roy W. Strickland Jr., 37 TAS
MSgt Thomas A. Tarrington, 63 TAS
MSgt Theodore F. Trainer, 36 TAS
MSgt James P. Truel, 4 MAS
MSgt Darrell C. Warringer, 30 MAS
MSgt Kenneth H. Williams, 156 TAS
MSgt Donald M. Williamson, 75 MAS
TSgt David L. Bacle, 6 MAS
TSgt Jimmy L. Bryant, 30 MAS
TSgt George D. Damron, 37 TAS
TSgt Roger H. Drenning, 76 MAS
TSgt George E. Embley, 6 MAS
TSgt Joseph P. Fuller, 58 MAS
TSgt Richard L. Haas, 707 MAS
TSgt Myron R. Hysell, 86 MAS
TSgt Ernest L. King, 30 MAS
TSgt David N. Lehmer Jr., 702 MAS
TSgt Richard MacQuarrie, 18 MAS
TSgt Donald B. Millard, 41 MAS
TSgt Michael L. Pace, 300 MAS
TSgt Mitchell F. Powell, 6 MAS
TSgt Randall W. Reynolds, 183 TAS
TSgt Robert R. Stanfield, 76 MAS
TSgt Thomas A. Terbush, 57 MAS
TSgt Herbert R. Townsend, 33 ARRS
TSgt William Wytish, 702 MAS
SSgt Gregory R. Alley, 57 MAS
SSgt Wayne Rauschenbach, 30 MAS
SSgt Roger E. Smith, 4 MAS

This is only a partial list of awards earned so far in 1981. We will complete the backlog in the next few issues and then publish all awards as they are processed.—Ed

Flight Lines



Illusory Meaning

I have a question about two of the articles in the June 81 issue of *The MAC Flyer* concerning landing illusions.

On page 18 ["Landing Illusions"] under the "Weather" heading you state, "Rain and fog have varying effects on pilots' perceptions of an airfield. Heavy rain causes it to appear less clear and lights to be dimmer, and the runway looks *farther* away than it really is."

However, on page 21 ["Mishap with a Moral, Rained Out"] in discussing a landing accident you state, "Heavy rain created a visual illusion that caused the pilot to think the field was *closer* than it actually was.

Perhaps you could explain the slightly different approach these two authors took in explaining the heavy rain illusion.

Maj. Albert E. Taff
Chief of Safety
927 TAW (AFRES)
Selfridge ANGB, Michigan

*** Your point's well taken and deserves an explanation, so here goes. The two statements do seem to be in conflict, however, when considered in the context of their respective stories, their intended meaning will hopefully become clear.**

In the landing illusions article (pages 16-19), we are referring to weather phenomena that effect the entire airport environment, thereby reducing the quantity of light reaching your eyes from the runway or the airfield lighting systems. This apparent light reduction reduces the perceived details and contrast, making the runway look farther away.

In "Mishap with a Moral" we unfortunately used the word "when" to transition from the sentence you quoted to the next which reads, "When part of the runway was blocked from view by the downpour. . . ." To preclude this ambiguity, we should have said, "*Because* part of the runway was blocked from view by the downpour, the length-width perspective was altered so that the runway looked wider and shorter." In this case, heavy rain—actually a wall of rain from a thunderstorm—blocked the pilot's view of the far end of the runway, making it appear shorter and wider, thus closer, due to the change in length-width relationship.

I hope this helps clear up the various effects of rain as an obscuring weather factor for you and the several other readers who called to ask about our "error." Thanks for writing.

Hover Lover

For far too many years I have heard how the T-38, F-4 or the F-15 is the "sports car of the Air Force." As a diehard rotorhead with over 2,600 hours of helicopter time, I feel it is my obligation to rectify this glaring discrepancy. Here are my reasons for naming the H-1 (Huey) helicopter as the sports car of the Air Force.

1. Parts are hard to find and expensive.
2. The seats are uncomfortable and can never be adjusted right.
3. It's noisy and drafty even with the windows up.
4. It requires continual maintenance to keep it flying.
5. It demands the dexterity of a monkey to reach and operate the controls.
6. It leaks in the rain.
7. The heater and defroster couldn't warm up the Abominable Snowman in August.
8. The suspension is extra firm and it rides rough.
9. The gauges always flux.
10. The body is mostly aluminum and fiberglass and dents easily.
11. When leaks occur, they're always in some inaccessible place.
12. The best way to drive it is with a helmet on.
13. It will turn on a dime and give you change.
14. It's expensive to operate, but sure is neat to own.

Any questions fixed wingers?

Capt Steve Kranz
Det 5, 37 ARRS
Malstrom AFB, Montana

*** You've sold us, Steve, but then, like Harry Reasoner, we've always known that "Helicopter Pilots Are Different." We'd like to add one more item to your list: If properly operated by a true Hover Lover it can accomplish remarkable feats of vertical lift—safely.**

Radio Frequency

In regard to your "After Deadlines" section of the May 81 issue:

Coast Guard aircraft have used VHF-FM radio sets since 1971, and quite frankly we are still learning new uses for these units. Electronic specialty shops sell radio frequency directories that contain assigned frequencies and call letters for all of the following agencies: Police and fire departments including mobile units, hospital emergency rooms, ambulances, U.S. Forest Service observation towers, National Park Service Stations, and railroads.

During operational search and rescue missions there have been numerous occasions when I have referred to the directory that I carry in my flight gear in order to talk directly with agencies listed above.

Lt Comdr Gerald F. Arens, USCG
Flight Safety Officer
Coast Guard Air Station
Otis AFB, Massachusetts

C.R. TERROR

The Rhinestone Flyboy gets mud in his eye.

"How do you like it, Sammy?" asked C.R. as he tapped the bill of the dark blue tennis visor he had just put on.

"Very handsome, boss," commented the copilot, glancing at the Vain Volant momentarily. "A little nonstandard, but the embroidered MAC crest on the head band is a nice touch."

Since our schedulers always set us up to fly east before lunch, and west after, it seemed like the best way to prevent 'Sabreliner sunblindness'," explained C.R.

"You ever been into Scenic AAF before?"

"One of the few I've missed, m'boy," admitted C.R. "But it's got 7,000 feet of hard-surface runway, a tower, and a published approach, so it's bound to be a 'no sweat' destination."

"Rotun One, Memphis Center, descend at pilot's discretion to cross 20 miles west of Scenic at 5,000," instructed the controller.

Noticing C.R. had missed the call while fiddling with an enroute supplement (actually a Milky Way bar), Sam responded. This alerted the Ambient Aeronaut who commanded, "Take us out of orbit, Mr. Copilot!"

Sam retarded the CT-39's twin jets and started the descent. Flipping on his UHF switch, he heard the Scenic ATIS announce, "Ceiling 1,500 overcast, visibility three miles, light rain, temperature 74 degrees Fahrenheit, wind 220 degrees at 18 knots; landing and departing runway 31, expect ILS approach. . . ."

"Sounds pretty good, Sammy," commented the Addled Aviator. "I'll shoot the ILS to 31; no unusual hazards; and we'll use the normal switch positions. You tune in the right stuff at the appropriate times. I've got the aircraft."

Sam relinquished control to the Sabreliner Sultan and checked the crosswind chart. "Ah, boss, sorry to rain on your parade, but if the wind picks up two more knots it will be out of limits for landing on a wet runway."

"Did you figure that using our conservative MAC rules, Sam?" sneered the Sly Skipper.

"I figured it by the book," emphasized the long-suffering copilot.

"Good," affirmed C.R., "then we can definitely land safely. With my superior skill and cunning, the MAC restrictions need not be applied. Remember, Sammy, I was flying these mini-liners when they were new, and didn't even have antiskid."

The Terrorific Twosome worked their way through some stratus clouds and light rain until radar vectors placed them on ILS final. C.R. flew a passable approach and slowed the CT-39 to wet-and-slippery landing speed about a mile from the threshold. Sam noticed the windsock near the approach end was fully inflated and pointing perpendicular to the runway. The tower announced, "Rotun One, cleared to land, check wheels down; wind 220 at one-eight gusts to two-two knots."

"Boss, the gusts are out of limits," blurted Sammy.

"Doesn't feel gusty to me," argued the Pompous Pilot just as the Sabreliner's main gear impacted the Army Air Field's runway. Sammy retracted the flaps and C.R. pressed his pudgy feet on the brake pedals immediately. Suddenly the

CT-39 yawed to the right and began to drift toward the left side of the runway. The Ace of Airlift countered with rudder, aileron, brakes and nose wheel steering, all to no avail. He then shut down the left engine, hoping to straighten out the skidding Sabre. The biz-jet continued to slip toward the left side of the runway and the anti-skid system sensed the skid and went into full bypass, releasing the brakes. With the left edge of the runway rapidly approaching, the Large Left-seater shut off the right engine and pulled the emergency-brake T-handle just as the CT-39 slipped ignominiously into the mud, narrowly missing a runway light.

Rapidly coming to a halt in the soft turf, the miniliner sat up to its gear doors in mud. The only sounds were the crackling of cooling metal and the Huffing Honcho's heavy breathing.

Sammy turned off the battery and led the Stunned Skipper out the main entrance door. Outside the Army fire chief and airfield manager approached the Dumbfounded Duo. The Rotund One's expression changed from hurt to happy when he recognized the approaching olive-drab clad Lieutenant Colonel.

"Tankard!" exclaimed C.R. wringing the hand of the tall Army officer. "You're looking great, ol' buddy." Turning to his copilot, he introduced, "Sammy, this is Lieutenant Colonel Terrance Thomas Tread, United States Army, Armor Branch. We call him 'Tankard' for short. He's one of my best and oldest friends—we fought some big ones together down at Fort Bragg."

Sam and the hulking Army officer exchanged courtesies. The Lieutenant Colonel turned to C.R., "That was an outstanding arrival, C.R. Do you think it will still fly? Our commanding general is eager to get to Washington, ya know."

"Doesn't look like we hurt anything important," estimated the Errant Aeronaut, surveying the CT-39's underside for damage. "But I don't think I can taxi it out of here till the weather dries up."

"Well, if that's your only problem, I've got the solution," boasted Tankard. He then turned, boarded his jeep and raced away across the airfield.

Sam gave his AC a puzzled look, "Wonder what he's up to, boss?"

"Don't know, Sammy, but if I know 'the Tank' it will be both spectacular and effective. Let's go inside before we get any wetter," C.R. instructed, mounting the entrance steps.

Sammy followed, and once they were seated in the cabin he asked, "Aren't you gonna call DOOF? We really ought to report this."

"Those ground-bound turkeys would come up with twenty reasons why we should spend the night in this backwater burg, Sam, and personally I've got better things to do at home."

Sam persisted, "But shouldn't we have the aircraft inspected, fill out a safety report—"

"Nonsense, m'boy. Let's see what my buddy Tankard comes up with before we overreact to such a minor setback," rebutted C.R.

The crewmembers' conversation was cut short by a grinding and clunking sound outside of the aircraft. C.R. and Sam emerged to find an M-60 tank being hooked up with log chains to the Sabreliner's main gear. "Told you I had a way to get you out of this mud, C.R.," called Lieutenant Colonel Tread from the mechanical monster's turret.

The Surprised Skipper clambered back aboard the CT-39 to ride the brakes as the soldiers finished securing the chains. Opening the sliding window, C.R. waved his ebony cigarette holder like a sword and

shouted, "Charge!"

Aboard the M-60,Tankard gave the word, the tank moved forward, the chains drew taut, the treads gripped the turf and the Sabreliner slipped out of the soft ground. Standing on the adjacent taxiway with Captain Sam, the Army tankers cheered.

The Terror and Tread team towed the CT-39 to a spot in front of airfield ops and a civilian maintenance man chocked the wheels.

While the soldiers were unhooking the tank, the Master Manipulator managed to wrangle a quick aircraft wash job out of the transient maintenance men. With the bottom of the Sabreliner hosed off, Sammy checked it for damage and found none. C.R. ordered a wing load of fuel and headed for the ops building.

Inside, Sam checked the weather and notams for Andrews and computed takeoff data; C.R. checked the vending machines. As soon as the wing fuel tanks were pumped full, the Terrorific Twosome and their passengers boarded the Sabreliner.

The rest of the mission was relatively uneventful. C.R. resisted all efforts by his competent copilot to officially report their side trip at Fort Scenic and the details of the flight soon sunk into the bottomless resevoir of flying trivia stored in the Bibulous Bumbler's brain.

A couple of weeks later, C.R. sat sipping his second Friday afternoon Terrorific 'tini at the O'Club. A bright-eyed captain spotted the Rhinestone Flyboy from the barroom door and elbowed his way through the crowd with a major in tow. "Major Terror, it's really great to see you, sir," greeted the captain.

"Well, welcome to the collective celebration of the incoming weekend, Captain Riley," responded C.R. "Who's your friend?"

"Oh, excuse me, sirs. C.R., this is Major Bond Riter. Bond works at Headquarters MAC Safety. He's spent all week helping me investigate a messy mishap down at Fort Scenic."

"Zat so?" slurred the Celebrating Skipper. "What's happened?"

"You remember Lieutenant Frosh, the youngest pilot ever to upgrade the AC in our squadron; our first UPT-input to check out; our—"

"Yeah, yeah, I know 'the kid'," groaned C.R. with a waive of his hand. "Hold it, Riley, is this going to be one of your grim safety tales?"

"Afraid so, Major."

"In that case . . . " the Rotund One motioned for the bar keeper to serve up three Terrorific 'tinis."

"Thanks, C.R., always liked to drink on field-grade money," affirmed Captain Riley. "Anyway, Lieutenant Frosh took a mission into Scenic with seven stars—one three and a pair of twos. It was raining and there was a stiff crosswind, but the visibility was good. Unfortunately the aircraft he had didn't have an operable antiskid."

"No kidding?" interrupted C.R. "I went in there a few weeks back with almost identical weather. We had a heck of a time getting stopped on the runway. In fact—and you'll have to promise not to tell anyone—" (both safety officers nodded affirmatively and then smiled at each other) "I almost got stuck in the mud."

"That sounds a lot like what happened to the Lieutenant," commented Major Riter. "The Army folks recently lengthened and resurfaced the runway. That made it so we could take our CT-39s in there. It turns out that the special new runway coating they used is absolutely great when it's dry, but when it's wet it's slippier than a greased banana peel. Seriously, we measured the wet RCR at zero-five!"

"I knew it couldn't have been my pilot technique that skidded us off the runway," boasted the Pompous Pilot.

Captain Riley raised his eyebrows. "Lieutenant Frosh's aircraft skidded off the runway near the end, took out three runway lights and collapsed the nose gear. Fortunately nobody was hurt."

"Funny thing," interjected the Major from MAC, "but Frosh told us some Army Lieutenant Colonel came around and offered to use a tank to pull the airplane out of the mud."

"Musta been 'Tankard,' same guy that—" C.R. stopped in midsentence as his 50-knot brain finally caught up with his Mach 2 mouth.

"Tell us the rest of the story," pleaded the captain.

"Yes, Major Terror, we'd *all* like to hear the whole story", boomed a voice behind C.R.

The Bumbling Buffoon turned to see Colonel Fang on the bar stool at his six o'clock position. "Well, er, ah, it was nothing, sir," stammered C.R. as sweat broke out on his pudgy brow. "Just a minor delay."

"Okay, Major," growled the colonel, "if you don't want to tell us here, how about my office at 0730 Monday morning?"

C.R. cringed and took the apparent lesser of two evils, "The guy's name is Lieutenant Colonel Terrance T. Tread, U.S. Army . . . ."

QUICK STOPPERS

Birds Do It

Even at a relatively slow 120 knots, a bird strike can do considerable damage. The H-53 crew was cruising along blissfully at 500 feet when suddenly a suicidal feathered songster slammed into the aircraft with a jarring thud. Unable to pinpoint exactly where the migrating missile hit, the rotory-wingers landed at a nearby base to check for damage. A visual inspection revealed a 3-inch hole and a 10-inch crack in the pylon cowling. They put a temporary patch on it and continued the mission. When they arrived back at their home-drome, maintenance inspection discovered a portion of the pylon cover assembly could not be repaired so a new part had to be ordered—just because of one bird!

Here's another avian encounter, only this one is between a C-141 and a Gooney bird. The Starlifter was making a day-VMC approach into Midway Island when one of the local feathered flyers flew right into number four engine just as the aircraft was in the landing flare. No abnormal engine indications were evident except that the Pratt and Whitney wouldn't go into reverse after landing. The ill-fated albatros had chipped one fan blade and bent three others requiring removal and replacement of the engine.

A Matter of Life and Breath

The C-135 had been airborne about 50 minutes when a suspected fuel leak in the number four main fuel tank caused the crew to abort the mission. On their return flight, one of the navigators detected a peculiar odor coming from the vicinity of the number three generator control panel, and after two or three minutes, got up to investigate. The nav spent the next few minutes trying to locate circuit breakers in the increasingly intense smoke and fumes. Although several minutes exposure to the toxic fumes occurred , no supplemental oxygen was used. A short while later, he began to feel dizzy, nauseous and began to get a headache. He then went on 100 percent oxygen and after landing was taken to the flight surgeon's office where he was promptly put under observation for 24 hours. Don't flirt with fumes or smoke, always assume they are toxic, and go on oxygen as soon as possible—it could save your life.

Drink Up

The peak of North American hot weather comes in mid to late summer and early fall when the oceans and air have been warmed by the sun's direct rays. The ancient Greeks called this oppressive period "dog days" because it coincided with the appearance of the dog star Sirius. But even if this year's summer and early autumn temperatures don't break any records, it's wise to know how to cope with the heat. An important tip is to drink plenty of water—even before feeling thirsty. Thirst is a bad index of when to get a drink. By the time we feel thirst, we are already a quart low. Reactions to heat are often precipitated by a lack of water in the body. A lot of "old salts" and football coaches used to preach "water discipline." They told the troops that going without water makes a person stronger, when in fact it makes you weaker. The time-honored practice of swallowing salt tablets to replenish the body's supply has also been thrown out for people on normal diets. Salt has been found to slow the body's adjustment to heat and also to cause gastric disorders. So make sure you drink more water than you think you need. You'll be surprised how much better you feel and how the heat doesn't seem so oppressive.

—Crosscheck

Jury-Rigged Retriever

It was an ideal day for flying, smooth and with only a light westerly breeze blowing, as the Army OH-58 took off. Flying to a live fire area, the crew made a range sweep to insure the area was clear of people, cattle, and sheep, then decided to pick up some small flare parachutes lying around on the ground. The little parachutes were greatly prized as souvenirs and toys. Knowing that a landing should not be made in the impact area, someone fashioned a grapple using a broom handle with a wire shaped into a hook. While the pilot hovered the helo two to five feet off the ground, the IP picked up the parachutes and handed them to the passenger in the back seat. After gathering about 15 of them the crew continued with the range sweep. Later, somebody spotted two large parachutes and the pilot maneuvered the 58 so they could pick them up, too. But as one of the canopies was being pulled into the aircraft, part of it floated up over the engine compartment. Feeling some strong bumps in the cyclic, the pilot lowered the collective and put the chopper on the ground. Touchdown felt normal, but then the Kiowa began a slow roll to the right. Even though the pilot applied left cyclic and the copilot rolled off the throttle, the roll continued until the mangled fuselage came to rest on its right side. The passenger was able to escape immediately, but the pilot had to wait until the IP could climb off the top of him before making his exit through the left door. When the chute billowed up, it was sucked into the rotor system, causing the control tubes to be severed and resulting in the chopper rolling over and destroying itself.

– Adapted from U.S. Army *Flightfax*

Tail Rotor Tango

The exercise staged to work out the search and rescue forces involved a forward air controller, an HC-130, an HH-3E, and simulated downed crewmembers and aggressors. The ground parties briefed separately from the aircrews, so the rescuers wouldn't have advance knowledge of where the good and bad guys were spending the night.

During the evening the survivors put out a white parachute panel to mark their position for the FAC, and picked out a clear landing zone several yards away for the Jolly Green to use the next day. They thought the plan was for the H-3 to break off before reaching the panel and then come back to land and pick them up, so they didn't stake it down.

The next morning the Jolly Green orbited outside the hostile fire area for about an hour while the FAC "neutralized" the aggressors and picked out an ingress route for the H-3. When the FAC told the survivors that he was leaving to get the helicopter, they figured they had about 30 minutes before the rescuers would arrive, so they didn't hurry about picking up their personal gear.

Much sooner than the ground party expected, the Jolly Green appeared on the scene and zeroed in on the panel. As it was setting up a 5-to-10-foot hover, the aggressors simulated ground fire, hoping to force the H-3 to break off, but the helo pilots knew the FAC had "wiped out" the bad guys, so ignored them. By the time the ground controller called the Jolly crew to tell them to land in the nearby clearing, the rescuers had already deployed their hoist and PJs, and were committed to hover. Meanwhile the survivors scrambled around trying to secure their personal gear so it wouldn't be blown away by the chopper's rotor wash.

Suddenly the flight engineer saw a shadow at the Jolly's 6 o'clock position, and looked back just in time to see the unsecured panel billow up into the tail rotor. The crew heard a loud noise, the Jolly Green whipped 10-degrees to the right, and the pilot couldn't get the left pedal to respond to his inputs. This was rapidly followed by a series of lateral kicks and the engineer calling, "Tail rotor! Tail rotor!"

The copilot retarded the speed selectors to idle as the AC maneuvered the Jolly Green for an immediate touchdown. The left-seater then shut down the engines and the pilot used the remaining rotor rpm to cushion the landing. Fortunately damage was limited to the tail rotor and the crewmembers escaped without injury.

Exercises provide excellent opportunities for us to prove our operational concepts and test our professional skills. However, this practice rescue taught quite a few more lessons than originally intended at a cost of over $10,000.

You Picked a Fine Time to Leave Me, Loose Wheel

The C-5 was coming in for a full stop after the long flight from Europe. Unfortunately, one of the wheels on the left forward bogie decided to get off early, screwed itself right off the axle and promptly went AWOL. On its way into the "boonies," the wayward wheel with attached tire was overtaken by the aft bogie which resulted in damage to, and the subsequent deflation of, the other tires. (Very messy!) Another eventful ending to an otherwise uneventful flight! An "army" of maintenance troops later combed the runway and surrounding grass and recovered the major components of the crumpled wheel. After a detailed examination, the experts surmised that the lock ring tabs were not properly seated in the axle slots and that a "back torque," directed by the tech order was not accomplished when the wheel was installed.

—436 MAW's *Flying Safety Highlights*

AFTER DEADLINES

"THUNDERSTORMS OCCUR DURING ALL SEASONS in the tropics, and from late winter through fall in the temperature zones (witness the severe tornado which struck St. Louis, Missouri, at 0140 (CST) on February 1959, killing 21 people and injuring over 300)." This statement from AFM 105-5 (Weather for Aircrews) points out why we shouldn't think we've seen our last thunderstorm just because it's September. In fact, MAC crews have experienced several serious "off season" encounters with the nefarious cumulonimbus in recent years, including a tragic Class A flight mishap resulting from a lightning strike in which both aircraft and crew were lost--and this happened in November. Therefore, articles like "Weather Radar" on page 12 of this issue are always "in season."

MAJOR RICARDO W. MESTRE, A RESERVIST WITH THE 301ST MILITARY AIRLIFT SQUADRON, Travis AFB, California, has been chosen to receive the USAF Koren Kolligian Jr. Trophy. It is given annually to the Air Force aircrew member who best handles an in-flight emergency. Major Mestre directed emergency actions after an engine caught fire on his C-5A cargo aircraft. Major Mestre and crew also received the MAC Excellence in Airmanship Award and the US AF Well Done Award for this aerial exploit which saved the aircraft and the lives of 94 people on board. Congratulations!

FINSTALL ERRONEOUSLY FOUND. In the August Quick Stopper, "Finstall Found," we incorrectly stated the probable cause of the mishap as being the infamous "finstall." Well, the real cause of the incident was later attributed to poor pilot technique. Seems the IP allowed the C-130 to go below charted minimum control speed with number 1 engine simulated out. Following Dash-One procedures would have prevented this hair-raising hiatus.

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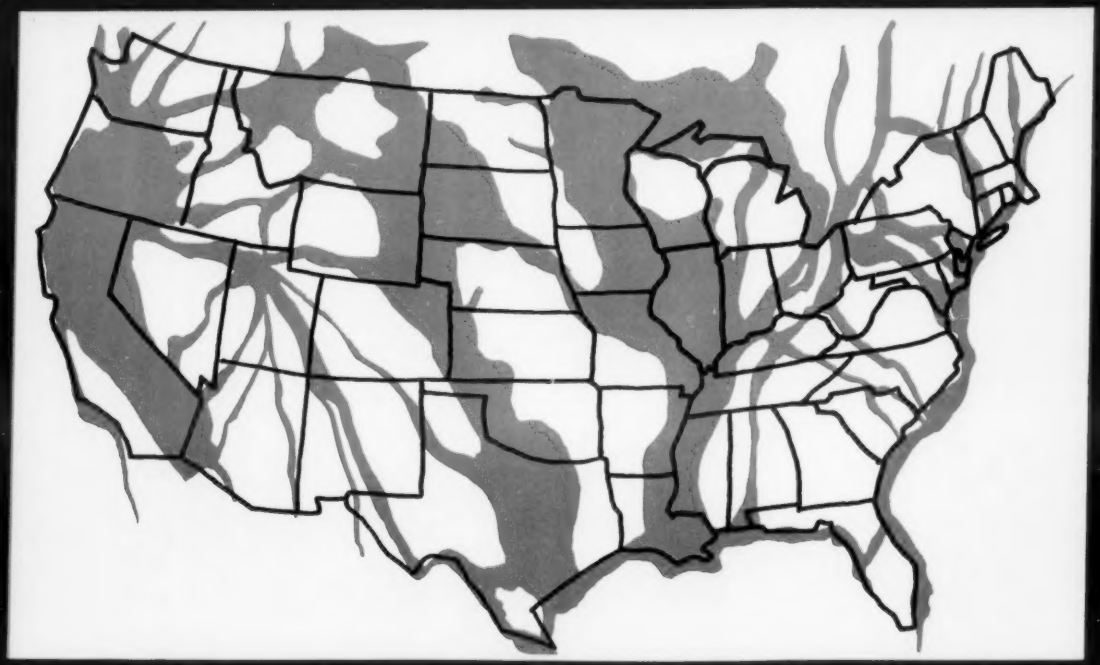
Fall Weather Starts Feathered Flyers on the Move

Bird Migration Patterns